

Intelligent Solutions Sustaining Urban Economies – Master Classes case study

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Abstract. THE ISSUE is a project within the Regions of Knowledge scheme funded through the European Commission's 7 Framework Programme. THE ISSUE focuses on Traffic, Health and the Environment to achieve Intelligent Solutions for Sustaining Urban Economies by bringing together innovative research-driven clusters to coordinate European research and technology development in 6 areas. These comprise ITS; transport impacts on urban mobility; transport greening; intermodal regional transport; safety and security of citizens; and associated economic, health and environmental impacts. THE ISSUE project particularly addresses the use of space technologies from satellite remote sensing and navigation, as well as GIS and computer intelligence technologies in transport-related sectors. This paper specifically looks into the planned Master Classes program.

THE ISSUE project comprises research clusters from the East Midlands Region (UK), the Midi-Pyrenees and Aquitaine Regions (France), the Molise Region (Italy) and the Mazovia Region (Poland). Each region has set up a three-way partnership between regional authorities, academic partners, and industry contributors working to draw together the technology innovation capabilities in the regions and connect the research with the needs of managing traffic, transport, and air quality that the regional bodies are responsible for. The three-year project is supporting scientists, engineers and development agencies from the different regions to work together, using the latest space and information technologies, to develop more effective methods of easing road congestion and improving the urban environment.

As part of THE ISSUE project Master Class knowledge exchange programmes will be developed using material from the earlier review of applicable technology and expertise within the THE ISSUE consortium. Two variants will be developed, one focussing on senior management and policy/strategy makers and the other with a focus on technical awareness and implementation. The Master Classes webinars and workshops will be trailed and delivered through workshops for core partners and associates. The case studies, which will be part of the Master Classes, will present information on how cartography, GPS&GIS database applications, navigation and remote sensing are used in urban transport, health and air quality related data. These Master Classes webinar materials will contribute to the exchange of knowledge and expertise in sustainable traffic solutions between academic, business and public sector partners within and across the 5 European regions.

Keywords: space and information technologies, Geographical Information Systems (GIS), GPS, intelligent transport systems, navigation systems, urban visualisation

1. Introduction

An overriding principle of the EU is the promotion of free movement of goods, services, people and capital. Development strategies directed towards supporting this principle lie in the areas of integrated transport infrastructures and enhanced human mobility. Both are necessary on regional, national and transnational scales. Transport and environmental policy sits high on the development and planning agendas of most urban, regional and local authorities throughout the European Union.

Consequential effects on citizens' health and environmental impact are constraining influences in these policy agendas.

The United Nations estimates that more than 50% of Earth inhabitants live in cities. Traffic congestion is a global urban problem with far reaching impacts on economic sustainability, mobility, citizens' health and the environment. Optimisation of the use of road space and other transport systems is a key requirement to meet urgent needs for congestion reduction. Additional economic, social and environmental benefits accrue from better use of the transport infrastructure. European policy directives demand carbon emission reductions and a modal change in attitudes towards the use of public transport.

The development of transport technology and policy lies at the heart of achieving sustainable urban economies across Europe. THE ISSUE project aims to achieve greater integration, coordination and exploitation of existing Research and Technology Development (RTD) programmes across 5 regions in Europe. The key focus will be on the areas of Traffic, Health and the Environment to achieve Intelligent Solutions for Sustaining Urban Economies (THE ISSUE) by fostering transnational cooperation and collaboration between innovative research-driven clusters. THE ISSUE consortium will improve the capacity of 5 European regions to invest and develop their research in support of sustainable economic development. It will promote sustainable transport in an integrated, technology-led and user friendly way and boost the competitiveness of transport-related aspects of each region's economy. The outcome of THE ISSUE will be a significant research and implementation programme to develop economy-driving, environmentally-sensitive, traffic and transport initiatives that will be delivered by regional research clusters and provide more sustainable transport economies in the cities, towns and regions across Europe. THE ISSUE is adopting cross-disciplinary approach to create and implement in the following themes i.e. transport impacts on urban mobility, transport greening, intermodal regional transport, safety and security of citizens, associated economic, health and environmental impacts.

THE ISSUE has established a vibrant transnational consortium of research-driven clusters in 5 regions: East Midlands (UK), Midi Pyrénées and Aquitaine (France), Molise (Italy) and Mazovia (Poland). The triple helix approach of business and academia in partnership with local/regional authorities in each region will bring innovative solutions and new methodologies for traffic control and management into the realm of regional transport policy and environmental impact planning.

2. Master Classes knowledge exchange

Measures to facilitate implementation include identifying and promoting priority RTD concepts, running knowledge exchange programmes, sharing best practice, setting up pre-project feasibility study groups to increase cluster capacities, and hands-on mentoring for new triple helix research clusters through pre-project studies. RTD contributions to regional strategic objectives will be addressed through secondments and exchanges of senior executive staff and researchers between organisations and authorities within and between clusters in different regions. A Special Interest Group (SIG) in Intelligent Transport and Traffic Management Systems will be established. Best practice in the development of Local Transport Plans (LTP) in mature regions indicate the use of a strong evidence base drawn from transport users (industry and the travelling public), which is informed by the RTD base (HEIs and transport experts based in sub-Regional & Regional Government). The Joint Action Plan (JAP) will be implemented in part via with these regional mechanisms, therefore the mentoring process will seek to identify the best practice for the development of LTPs in mature regions, and transfer that knowledge to emerging clusters. The implementation mechanism will include Knowledge Exchange Programmes, by which best-practice will be disseminated supported by Professional Bodies, and staff exchanges as detailed whereby key personnel are exchanged between mature and emerging clusters.

The Master Class knowledge exchange programme will be developed using material from the earlier review of applicable technology and expertise within the THE ISSUE consortium. This will consider areas of expertise and weakness. The programme will also draw on published material and outputs from other programmes within the European Technology Platform. With an overall objective of knowledge exchange, Master Classes will focus on sharing of best practice targeting key themes (e.g. traffic management, managing air quality). Local authorities will be asked to provide examples of where transport solutions have been implemented in order to inform other authorities of the process and how they can avoid mistakes.

The Master Class programme will be delivered through a series of webinars and workshops. A monthly webinar programme will be established based on key themes (an output of the JAP), but will also provide an opportunity for informing about future opportunities for collaboration. Webinars will be on a fairly broad level but will include specific examples and case studies to ensure relevance. We will also look outside THE ISSUE at other European projects to ensure maximum awareness of other similar activities. Stress will be given for the Master Classes to be tailored in order to aim at local authorities and decision makers as well as research and industry. Some

Master Classes will therefore take a more technical approach, which other will consider implementation.

A number of workshops will also take place covering key themes in more detail. Discussions will involve representation of the three aspects of the triple helix to ensure wide participation and views. These will be a good opportunity for exchange of knowledge between different types of organisation, but also to work together to try to identify potential collaborations towards solving our transport challenges.

The methodology of deciding the content of the Master Class series is as follows:

1. A Master Class working group monitors and makes decisions on the content and structure of the programme
2. A call for Master Class material to be put out to THE ISSUE project partners in April 2013 with each region expected to contribute
3. The first webinars to begin in the summer/autumn 2013.

3. THE ISSUE Master Class hands on Workshop

The first Master Class will be organised by the University of Nottingham. It will be presented during THE ISSUE conference in Warsaw and will be focussed on a location based Open Street Map case study.

The Open Street Map for Great Britain (OSM-GB) is a research project based at the University of Nottingham. A good example of crowd-sourced geospatial database is Open Street Map. There has been tremendous increase in Volunteered Geographic Information (VGI) in the last few years and this trend is set to continue. This has specific interest for transport related data for the future. OSM-GB is a new project Initiated at Nottingham Geospatial Institute (NGI) at the University of Nottingham with ¹Spatial and KnowWhere for measuring and improving the quality of OSM for Great Britain.

The key learning outcomes for this workshop are to help understand Volunteering Geographic Information and its importance to transport planners and users. Also the importance and role of Open Source, Open Standards, Open Data for transportation. The participants will also learn to work with OSM-GB Web interface and how to use the OSM-GB Web Services (WMS + WFS) in Quantum GIS (a free and open source GIS).

4. THE ISSUE Regions

The following projects in which THE ISSUE partners are actively involved are under consideration as topics suitable for dissemination to partners through the Master Class Programme.

East Midlands (UK)

The East Midlands is the UK's leading region for research into space technologies and the commercial exploitation of Downstream Space Services. The knowledge base is enhanced by the Regional Science-to-Business networks, which inform our research objectives, and ensure that innovation delivers solutions that have commercial value, and meet policy needs. Using the triple helix approach we found that the key transport policy objectives for our region are congestion reduction, air quality enhancement and modal shift. Three major universities in the region are actively engaged in space related research and the development of commercial outputs in transport with local business and local authorities. Therefore, fundamental research arising from the Research Technology and Development are been directed to meet these and similar policy needs, and are commercially viable.

Involvement in the Master Class knowledge exchange programme will provide the East Midlands Region with an excellent approach to share the research activities that are being carried out in the regional universities with the other actors, for the local authorities to present their needs and priorities to research and industry and for industrial partners to promote their activities and expertise within the region. In addition, it will allow business and universities to share their expertise with other partners throughout Europe. Particularly for businesses, this provides an excellent opportunity for European expansion and promotion. The following projects in which THE ISSUE partners are considered as topics suitable for dissemination to partners through the Master Classes Programme.

iTRAQ (Wells 2011) is a dynamic traffic management system for optimising use of the road network to meet growing demands from governments across the United Kingdom and Europe, under EU directives, to reduce traffic congestion, carbon emissions and air pollution (Raventos 2012) to benefit of quality of life and health of citizens in urban environments. The project has been developed by a consortium of industry, academic research institutes and local authority partners working in direct collaboration with the transport and environmental divisions of a local authority to develop new technological approaches to intelligent traffic and air quality management that particularly address local authority targets.

A one-year feasibility study was used to develop a novel approach to traffic congestion and air quality measurement around the operational traffic control system in use in the City of Leicester, by using real time feeds of atmospheric pollution and traffic flow data, to develop self-learning selection criteria that are used to optimise traffic flow through road junctions. The iTRAQ emulation delivers traffic flow improvements on 89% of occasions, an overall improvement in vehicle waiting time of more than 3% and air quality improvements of up to 2%.

A second study is underway, led by the university partners with a second local authority partner, to extend the feasibility study to a larger road network as well as developing new software modules to speed up the iTRAQ response time to a level more suitable for operational use. This will be followed by a full-scale urban demonstration of operational use and market readiness of iTRAQ for the ITS and Intelligent Mobility market sectors.

Results from the iTRAQ programme will form the basis of one of the Master Class webinars or workshops for THE ISSUE.

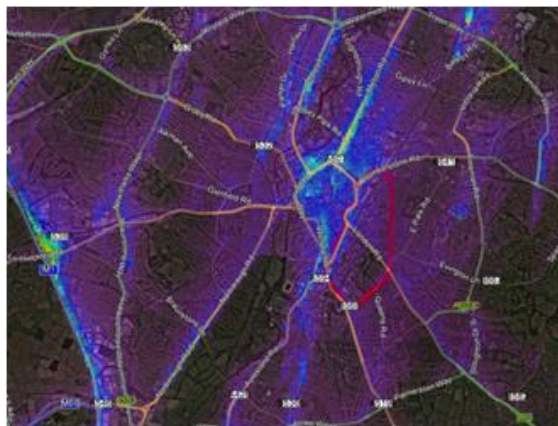


Figure 1. Modelled nitrogen dioxide over Leicester. Modelled data produced by the Airviro model (SMHI) and overlaid onto GoogleEarth.

Midi-Pyrenees & Aquitaine (France)

Midi-Pyrénées and Aquitaine regions are the worldwide leader in terms of space technologies and related services as positioning or data collection. Thanks to the presence of different actors from the satellite industry to the important network of SMEs focused on satellite applications, as well as actors as European Satellite Services Provider (ESSP), the European Geostationary Navigation Overlay Service (EGNOS) operator; the territory

covers the entire value chain from satellite manufacturing to GIS services. This fertile ground, coupled to increasing needs of more intelligent transport management, lead to the emergence of collaborative projects, mainly based on positioning and navigation technologies of vehicles (from aircrafts to bicycles), or citizens (from shop customers to disabled persons). Today the ambition of Midi-Pyrénées/Aquitaine regions is to create innovative and high added value services that could solve issues like traffic regulation thanks to a better use of collected or open data, or issues related to citizens' mobility thanks to innovative travel platforms and GIS for example.

Today the role of the competitiveness cluster Aerospace Valley (AV) is to be at the heart of these topics, with the objective of synergies and emergence of projects between the capabilities of local R&D actors, the potential of research of universities and laboratories, as well as the main concerns of local and regional authorities. The non-profit association AV is one of the most efficient triple-helix associations in France, with the accreditation of more than 500 projects in 7 years. In this sense, the Master-Class process put in place in the framework of THE ISSUE, will be an opportunity for AV to create discussions and to exchange best practices with project partners and associated regions willing to foster triple helix organizations in their own territory via such organizations.

A project like NAVIG, accredited by AV, could be an opportunity for exchanging around the topics of urban mobility for visually impaired persons. This project was lead by IRIT Elipse laboratory (support to impaired persons) with the collaboration of Limsi laboratory (augmented reality), CerCo laboratory (human cognition), Spikenet Technology, Navocap, CESDV - the Institute of Blind People. The objective of this project was to hybrid GNSS positioning and real-time video processing in order to guide the visually impaired user in a complex urban environment. The prototype also supports the final action of the user with a specific sound system helping him to find a cash machine or to post a letter for example.



Figure 2. NAVIG Project

Master Classes provide an interesting opportunity to create discussions on technical issues like precise positioning in urban environment, as well as issues linked to new uses of technology.

Mazovia (Poland)

Mazovia is a leading Polish region in terms of introducing innovative solutions to boost its economy. Hence the region was one of the co-founders of the Network of European Regions Using Space Technologies – NEREUS and continually supports usage of space technologies in the region. Mazovia gathers the most relevant academic, research and business actors in fields of space technologies, including positioning and navigation as well as GIS services.

Mazovia crucial needs regarding transport systems address firstly coherence of the entire transport system by investments in transport infrastructure as well as further development of innovative technologies (including ITS) to improve road and traffic management and safety and to reduce transport environmental impact. RTD challenges, such as usage of Location-Based Services (LBS) solutions and Copernicus (GMES) services are more and more frequently and eagerly introduced for improvement of transport functioning in Mazovia. The need of better maintenance of existing infrastructure engaging innovative solutions is emphasized with increasing frequency.

Satellite positioning systems became one of the crucial tools implemented in the transport related sectors. Among main aspects of application of satellite technologies in urban transport are integrated passenger service system (applied, for example, in Warsaw trams), using signals from GPS

satellite positioning system and GPRS data transmission. Also visualization and analysis of real-time data using GIS technology to manage intelligent traffic control system is used in the most critical junctions in the cities of the region and there is an urgent need of further expansion of the system. The increasing usage of GIS technologies in traveller information systems allows making decisions about the initiation of travel, duration, choice of means of transport and route, based on real time data.

The triple helix approach provides an excellent platform for the exchange of ideas and policy requirements. This ensures that research driven clusters are developing solutions that meet regional government policy objectives and are commercially viable. Mazovia is on their way to establish a successful cooperation within regional triple helix and finds THE ISSUE project as a great chance to better understand how increase its efficiency by learning from more mature clusters. Establishment of a triple helix creates a mechanism for bringing together the needs and priorities of local authorities with the expertise and knowledge of regional research organisations and industry.

The Master Class knowledge exchange programme contribution from Mazovia Region will be focused on the issues of the citizens' participation in the transport network development including ITS solutions based on the spatial information. The public participation geographic information system (PPGIS) methods and geo-portal technology approach will be applied for integrating citizens knowledge and wisdom. The citizens viewpoint will be expressed by internet means and during local meetings with the use of advanced geo-visualisation tools.

Molise (Italy)

Molise is a focal point of junction between the regions of the Tyrrhenian Sea and the Adriatic Sea. In this context, mobility strategies will have a marked impact on the environment of a region characterized by natural areas of primary importance and value. Furthermore, the development of modern transport network enable to preserve and enhance the green areas and increase the efficiency of the viability will have a decisive impact on local economy and the health of citizens. Through the Geosat Molise Consortium, Molise intends to invest for further improving of the research sector, in particular in earth observation and navigation technologies and applications as well as in the sector of production processing, leveraging on the experience of e-GEOS, a leading international player in the geo-spatial business and of the University of Molise, experienced in several international and national RTD environmental projects.

The regional triple helix approach and THE ISSUE project partnership is a stimulating framework for analyzing gaps and opportunities identified in the region, exploiting scientific and technological exchanges and cooperation with the local hi-tech SMEs. Based on users' needs and the cluster skills, Molise objective is the evolution of customized solutions for its territory and the establishment of innovative applications integrating different types of technological assets including satellite telecommunications, satellite images processing and analysis, satellite navigation, ICT and mobile technologies, in situ data collection, analysis and simulation methods, primarily around the themes of improving safety, security and health for urban communities, optimizing and enhancing the management for the public transport system.

One of project, coming from the analysis Master Exchange Programme, which is showing the effectiveness of the technological integrated approach, is the ANAS RUMORE Project, led by e-GEOS, in which the satellite and aerial image processing, DEM and 3D modelling techniques, in situ sensors positioning and traffic data collection, data ware house technologies, methods of analysis and simulation of different sources of data contribute to the evaluation of urban traffic impact on citizens health and in the definition of a traffic mitigation measurements plan.

The Consortium as a whole

It is clear how each region has different expertise and knowledge to share with each other and this is one of the core goals of the knowledge exchange programme. The Master Class topics presented above will form only part of this knowledge exchange which will bring together core expertise from throughout Europe to attempt to find solutions to the transport challenges that face their individual regions.

5. Conclusions

As part of THE ISSUE project Master Class knowledge exchange programme will be developed using material from the earlier review of applicable technology and expertise within the THE ISSUE consortium. The Master Class webinars and workshops will be trailed and delivered through workshops for core partners and associates. The case studies detailed above which will be part of the Master Classes, will present information on how cartography, GPS & GIS database applications, navigation and remote sensing are used in urban transport, health and air quality related data. The overall aim of the Master Class programme and workshops is to

provide knowledge exchange to the wider community, the triple helix and build future research collaborations.

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